

Interactive comment on “Modelling environmental influences on calving at Helheim Glacier, East Greenland” by S. Cook et al.

Dr. Colgan

william.colgan@colorado.edu

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Dr. Cook - I enjoyed your discussion paper on the calving processes of a grounded glacier. I am also interested in parameterizing iceberg calving in a physically-based, yet computationally efficient, fashion. I recently found that ice cliff height (i.e. the maximum height of a glacier's calving face above sea level) served as a remarkably good downstream boundary condition for iceberg calving (in Colgan et al., 2012). I have not given this convenient proxy further consideration until reading your discussion paper. I now wonder if it may be possible that crevasse depth ultimately modulates the ice cliff height of grounded glaciers (whereas naturally buoyancy would play a prominent role in the ice cliff height of floating glaciers)?

Can you provide any insight on how the relative depth of crevasses might influence
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glacier terminus geometry over the ensemble of scenarios you consider? Right now the small tip of terminus geometry (i.e. elevation vs. distance, "a" subplots) in your figures looks virtually identical throughout all the scenarios. I would expect that the scenarios with greater calving and/or retreat to have an enhanced surface lowering, or decrease in ice cliff height, associated with this enhanced dynamic mass loss (but perhaps I missed something implicit).

Reference

Colgan, W., Pfeffer, W. T., Rajaram, H., Abdalati, W., and Balog, J.: Monte Carlo ice flow modeling projects a new stable configuration for Columbia Glacier, Alaska, c. 2020, *The Cryosphere*, 6, 1395-1409, doi:10.5194/tc-6-1395-2012, 2012.

Interactive comment on *The Cryosphere Discuss.*, 7, 4407, 2013.